REMARKS

The drawings, specification, and claims 21, 29-32, 34, 36, 37, and 39 have been amended. In addition, claims 46-51 have been added. Thus, claims 21-40 and 46-51 are currently pending in the case. Further examination and reconsideration of the presently claimed application is respectfully requested.

Objections to the Drawings

The drawings were objected to for including reference numbers which were not referenced to in the Specification. More specifically, references numbers 37', 39' and 41' as shown in Fig. 3, reference number 88 as shown in Fig. 6 and reference number 117 as shown in Fig. 7 are not mentioned in the Specification. The Examiner's thorough review of the drawings and Specification is appreciated. In response to the issues raised in the Office Action, a Request for Approval of Drawing Changes has been attached. As illustrated on the accompanying drawings, reference numbers 37', 39' and 41' in Fig. 3 have been changed to 37, 39 and 41, respectively. In addition, reference number 13' has been changed to 13. The indicated changes will be incorporated into the final, formal drawings to be filed when the application is allowed. Pursuant to 37 C.F.R. § 1.121, it is requested that the submitted changes be approved by the Examiner. In regard to reference numbers 88 and 117 included within Figs. 6 and 7, respectively, the specification has been amended to include such reference numbers. It is asserted that the changes to the drawings and specification are submitted for clarification purposes only and, thus, do not present new matter. Consequently, the removal of the objections to the Drawings is respectfully requested.

Objections to the Specification

The Specification was objected to for informalities. The Examiner's thorough reading of the Specification is appreciated. In particular, the heading of "Disclosure of the Invention" on page 4, line 6 was cited by the Examiner to be changed to "Summary of the Invention." In addition, the reference of "61-69" as noted on page 16, line 26 was cited by the Examiner to be changed to "61, 63, 65, 67 and 69". The Specification has been amended to include these suggested changes as well as additional clarification amendments. Since the Specification has been amended for clarifications purposes only, the changes do not present new matter. Consequently, the removal of the objections to the Specification is respectfully requested.

Section 112, 1st Paragraph, Rejection

Claims 21-40 were rejected under 35 U.S.C. § 112, first paragraph, because the specification was cited as not enabling one skilled in the art to make the invention commensurate in scope with the rejected claims. In particular, the Office Action states "the specification … does not reasonably provide enablement for using a broad band ultraviolet objective lens compris[ing] a first lens and a second lens of different dispersions for imaging a first object with a first wavelength and a second object with a second wavelength different from the first wavelength". In addition, claims 21-40 were rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in a manner as to enable one skilled in the art to make and/or use the invention. In particular, the Office Action alleges that discrepancies exist between the lens data included on pages 13-15 and the illustrations of Figs. 2-4. As will be set forth in more detail below, the § 112, first paragraph, rejections of claims 21-40 are respectfully traversed.

It is asserted that the Specification clearly teaches the limitations of claims 21-40 such that one skilled in the art would be enabled to make and/or use the invention. In particular, the Specification teaches a broadband ultraviolet objective with a first lens and a second lens of different dispersions for imaging a first object with a first wavelength and a second object with a second wavelength different from the first wavelength. As noted repeatedly in the Specification, the claimed catadioptric system may be suited for wavelength bands between and including 0.193 nm and 0.40 nm. In fact, the Specification states on page 18, lines 12-13 that "the most important advantage [of the system] is the objective's multi-wavelength capability." As such, the Specification clearly teaches an objective which is configured to image a first object with a first wavelength and a second object with a second wavelength different from the first wavelength. The Specification describes such an employment of the system through the use of a plurality of single wavelength light sources or multi-wavelength light sources as noted, for example, on pages 7 and 18, respectively. As such, it is asserted that one skilled in the art would be enabled to use the catadioptric system of the presently claimed case by the teachings of the Specification.

The Specification further teaches that the catodioptric system includes a "… field lens … made from two or more different refractive materials …" (page 4, lines 8-10). The Specification teaches different embodiments of such a field lens on pages 8-9 in reference to Figs. 2 and 3. It is asserted that such a teaching is clearly sufficient to enable one skilled in the art to make a field lens with different refractive materials. In addition, it is asserted that the manner in which light traverses through the

objective such that an object may be imaged is clearly provided within the Specification. In particular, pages 6-12 of the Specification describe the transient path of light through each of the lenses within the system, including the focusing lens group 11, field lens group 15 and catadioptric group 17. In addition, the Specification cites several applications for such a system on page 5, lines 30-35 and, in more detail on pages 15-17 in reference to Figs. 4-6. As such, the Specification teaches a catadioptric system which includes an objective having first and second lenses with different dispersions for imaging a first object with a first wavelength and a second object with a second wavelength different from the first wavelength.

As noted above, the Office Action alleges that discrepancies exist between the lens data included on pages 13-15 and the illustrations of Figs. 2-4. In particular, the Office Action states, in reference to the lens data on page 13, that "... it is not understood why applicant has disclosed both surfaces (22 and 24) hav[ing] positive values, i.e., 50.470." The Office Action cites a similar discrepancy with surfaces 24, 25 and 26 of the lens data included on page 14. Applicant agrees with the Examiner's assertion that positive and negative signs for surfaces of optical elements must be consistent within a system. Such a reference of positive and negative signs, however, does not necessarily have to follow the direction of the incident light beam as contended in the Office Action. The Office Action states "... if the surface of an optical element having a convex configuration with respect to the direction of the incident light beam is assigned as a positive sign then the surface of an optical element having a concave configuration with respect to the direction of the incident light beam must be assigned as a negative sign." Such an assignment of signs may not, however, consistently represent concave and convex configurations of surfaces within a system. As such, in some cases, positive and negative signs may alternatively be assigned to indicate a concave or convex configuration relative to the direction of other optical elements within the system rather than the direction of the incident light beam. In such a case, the spacing between surfaces may be used to indicate the direction of the incident beam of light as shown, for example, in the tables of lens data on pages 13 and 14 of the Specification. In this manner, the signs attributed with the radii of curvatures may consistently represent either a concave or a convex configuration of surfaces within the system.

It is asserted that such a representation of data is commonly accepted by those skilled in the art. For example, such a representation of data is included within cited reference of U.S. Patent 5,031,976 to Shafer. In particular, U.S. Patent 5,031,976 includes a table of lens data on pages 6 and 7, lines 51-69 and lines 1-6, respectively, which includes surfaces #11, #13 and #15 representing the fused silica surface of mirror 50. As shown in the lens data table of U.S. Patent 5,031,976, the radius of curvature of surfaces #11, #13 and #15 are each valued at 142.672 mm. Even though the incident light beam approaches

surfaces #11, #13 and #15 at different directions, none of the values for surfaces #11, #13 and #15 include a negative sign. Rather, the thickness data corresponding to surfaces #11, #13 and #15 within the lens data table has negative and positive signs which reflect the direction of the incident light beam. As such, the manner in which the lens data for Figs. 2 and 3 are represented on pages 13 and 14 of the presently claimed case is asserted to be correct and recognized by those skilled in the art. Consequently, it is asserted that the tables of lens data on pages 13 and 14 are shown in a manner as to enable one skilled in the art to make and/or use the invention.

In regard to the lens data included on page 15 of the presently claimed case, the Office Action states "... it is unclear why applicant has disclosed that the distance between surfaces 4 and 5 and the distance between surfaces 5 and 6 are equal to each other, i.e., both distances have the same value of 413.186." The Office Action directly correlates the distance between surfaces 4 and 5 and surfaces 5 and 6 included in the table of lens data on page 15 to the illustration of Fig. 4. In particular, the Office Action notes "... the distance between surfaces 4 and 5 is the distance defined between the exit lens surface of the lens element (73) and reflector (75) while the distance between the surfaces of 5 and 6 is the distance defined by the reflector (75) and the reflector-(77)." The lens data included within the table on page 15 of the Specification, however, is not necessarily a direct representation of Fig. 4. On the contrary, the table of lens data on page 15 is described as characterizing refractive and reflective surfaces of optical elements of "<u>One example</u> optimized for the particular objective seen in Fig.1 ..." (Emphasis added) (Specification, page 15, lines 22-23). On page 15, lines 14-16, the Specification references the distance between spherical mirrors 75 and 77 and meniscus lenses 71 and 73 of Fig. 4 as being at least 400 mm. Such a reference is used to generally characterize the distance between the optical elements and, therefore, may include a variety of embodiments. In particular, the reference may include embodiments in which the distance between the optical elements is substantially similar as shown in the lens data table on page 15 of the Specification. In addition, the reference may include embodiments in which the distance between the optical elements in slightly different as shown in Fig. 4. In fact, the disclosure of both scenarios within the Specification and Fig. 4 clearly specifies that the presently claimed system may be adapted for both embodiments. Consequently, it is asserted that the table of lens data on page 15 is shown in a manner as to enable one skilled in the art to make and/or use the invention.

For at least the reason set forth above, it is asserted that the Specification clearly enables one skilled in the art to make and/or use the invention commensurate in scope with claims 21-40. In particular, it is asserted that the subject matter of claims 21-40 is described in a manner such that one skilled in the art

would be enabled to make and/or use the invention. Consequently, removal of the § 112, first paragraph, rejections of claims 21-40 is respectfully requested.

Section 103 Rejections

Claims 21-40 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,031,977 to Gibson (hereinafter "Gibson"). In addition, claims 21-40 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,031,976 to Shafer (hereinafter "Shafer") in view of Gibson. To establish a *prima facie* obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974), MPEP 2143.03. Obviousness cannot be established by combining or modifying the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion or incentive to do so. *In re Bond,* 910 F. 2d 81, 834, 15 USPQ2d 1566, 1568 (Fed. Cir. 1990). The cited art does not teach or suggest all limitations of the currently pending claims, some distinctive limitations of which are set forth in more detail below. Accordingly, removal of the § 103(a) rejection of claims 21-40 is respectfully requested.

None of the cited art teaches or suggests an inspection system which is configured to detect defects on an object using the image of the object. Amended claim 21 recites in part: "A broad band ultraviolet achromatic catadioptric inspection system … configured to detect defects on the first or second object using the image of the first or second object, respectively. Claim 37 includes a similar limitation. Support for such a limitation may be found, for example, on page 19, lines 22-25, "… the broad band UV objective lens of the present invention can be used to provide a 'UV' color image of the object being inspected. This would be useful in defect and feature classification on a wafer." Gibson specifically discloses a photolithography system for forming patterns on semiconductor wafers by imaging a reticle. There is no teaching or suggestion, however, that such a photolithography system is configured to detect defects on the reticle through the image on the wafer. In fact, there is no teaching or suggestion within Gibson of using the photolithography system to inspect a wafer at all. As such, Gibson does not teach or suggest an inspection system as presented in claims 21 and 37, much less an inspection system which is configured to detect defects of an object from an image of the object.

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In addition, the deficiencies within Gibson cannot be overcome by the teachings in Shafer. More specifically, there is no motivation to combine Gibson and Shafer to teach or suggest the limitations of claims 21 and 37. In particular, one of the objectives of Shafer is "… to provide a system of the type described wherein a single type of refractive material can be used in the production of all of the lens

elements." (Shafer -- column 2, lines 23-26, emphasis added). Gibson, on the other hand, specifically teaches a system with two types of refractive materials. Consequently, combining Gibson with Shafer would render the system of Shafer unsatisfactory for its intended use. If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984) MPEP 2143.01. Furthermore, Gibson does not appear to teach that a system which corrects for secondary and tertiary chromatic variations as the system described in Shafer does. As noted in Shafer, "It is another object of the present invention to provide a system of the type described wherein the various functional components are configured to correct for secondary and tertiary chromatic variations in focus." (Shafer -- column 2, lines 18-21). As such, combining the teachings of Gibson and Shafer may change the principle operation of Shafer. In the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious.

The Office Action states, "The classification of the defects/features of the different areas of the reticle [may be] recognized/observed by a user during the process of exposure [of] the reticle to ultraviolet light." Although a user of a photolithography system may observe defects within an image, such an observation is not produced from the system and, therefore, the system, in such an embodiment, is not configured to detect defects as in the presently claimed case. Consequently, the aforementioned citation in the Office Action does not provide a *prima facie* case of obviousness for the limitations of the presently claimed case.

For at least the reasons stated above, no combination of the cited art teaches or suggests the limitations of claims 21 and 37. Consequently, claims 21 and 37, as well as claims dependent therefrom, are patentably distinct over the cited art. Accordingly, removal of the § 103(a) rejections of claims 21-40 is respectfully requested.

Although dependent claims 22-36 and 38-41 are patentably distinct from the cited art for the reasons set forth above, arguments presented in the Office Action regarding several of the dependent claims are traversed.

For example, the arguments regarding the wavelength value and/or range limitations of claims 25, 26 and 28 on page 7 of the Office Action are traversed. The Office Action states that the features recited in claims 25, 26 and 28 "... are not critical to the invention by the mutually exclusive of the values of the wavelengths claimed. For instance, while the wavelengths of the claim 25 are selected from a group consisting of 193 nm, 248nm and 365 nm then the wavelengths of claim 28 are 313 nm and 220 nm, which are both are not in the range or the group of wavelengths recited in claim 25." Claims 25, 26 and 28 are directed toward different embodiments of the presently claimed case and, therefore, are not dependent on each other. Consequently, the claimed values and/or ranges within claims 25, 26 and 28 do not have to nest within each other. Applicant is unaware of any legal precedent which deems different dependent claim features "non-critical" for being directed toward different embodiments of the invention.

The Office Action further states, in regard to the limitations of claims 33, 35 and 40, "... it would have been obvious to one skilled in the art to utilize any kind of light sources whose wavelengths are in the range of deep ultraviolet for an exposure process from a reticle to a wafer using the lens system provided by Gibson." Such a statement is traversed, however, since Gibson specifically teaches a photolithography system which utilizes just two wavelengths, 243.8 nm and 249.8 nm. Since the two wavelengths are in such a close range together, one skilled in the art would presume that only light sources adapted to illuminate light at such wavelengths would be used. The presently claimed case, however, allows for imaging across a much greater wavelength range and, therefore, may utilize a greater number of light sources. Furthermore, a *prima facie* case of obviousness for the limitations of claims 33, 35 and 40 cannot be established without some teaching or suggestion of using such light sources within Gibson.

Furthermore, although claim 29 is patentably distinct over the cited art for being dependent upon independent claim 21, it is believed that the subject matter of claim 29 is separately patentable for the following reasons. Claim 29 specifies the field size of the objective has a diameter of at least approximately 0.5 mm. Neither Gibson nor Shafer specifically disclose a field size for the objectives described therein. In fact, it appears that the intention of Gibson is to create a photolithography system which maintains field size in a range which is commensurate with prior systems. "... With increasing demands for higher resolution capabilities from such systems, applicant has recognized a need to modify the system so that even higher numerical apertures and higher resolution may be obtained while maintaining acceptable field size." (Gibson, column 1, lines 37-41). As such, one skilled in the art may presume that the field size of the objectives taught by Gibson and Shafer would be substantially similar to those of prior art objectives, absent any teaching or suggestion otherwise. The presently claimed case

discloses "... prior narrow band UV lenses [to] have a field size on the order of 0.1 mm or less." (Specification, pages 17-18, lines 38 and 1, respectively). As such, one skilled in the art may presume that the field size of the objectives taught by Gibson and Shafer would be approximately 0.1 mm or less. Consequently, claim 29 is asserted to be patentably distinct over the cited art.

__Patentability of Added Claims__

The present Amendment adds claims 46-51. Claims 46-51 are asserted to be patentably distinct over the cited art for at least the reasons set forth below.

The cited art does not teach or suggest an objective configured to correct primary and residual longitudinal and lateral color over an ultraviolet wavelength band greater than approximately 10 nm. Added claim 46 recites: "A broad band ultraviolet achromatic catadioptric inspection system, comprising a broad band ultraviolet objective configured to correct primary and residual longitudinal and lateral color over an ultraviolet wavelength band greater than approximately 10 nm. Support for such a limitation may be found, for example, on page 18, lines 12-18 of the Specification, "However, the most important advantage is the objective's multi-wavelength capability. Prior UV objectives are relatively narrow band designs in which good performance is limited to single wavelength sources, because of significant chromatic aberrations over wave-length bands as small as 10 nm in the deep UV (e.g., near 248 nm)."

As noted on page 6 of the Office Action, Gibson discloses "... a photolithography system wherein the illuminating light has design wavelengths of 249.8 nm and 243.8 nm." As such, Gibson does not teach or suggest a system configured to correct primary and residual longitudinal and lateral color over an ultraviolet wavelength band greater than approximately 10 nm. In fact, Gibson fails to even mention the distinction of primary and residual longitudinal and lateral color created from an imaging system, much less their distortions or systems configured to correct them. As such, there is no motivation within Gibson to create a system which corrects primary and residual longitudinal and lateral color, particularly over an ultraviolet wavelength band greater than approximately 10 nm. Shafer, on the other hand, does disclose correcting primary and residual longitudinal color. However, Shafer fails to disclose a system which corrects primary and residual lateral color. As such, Shafer fails to disclose the limitations of claim 46. Without any teaching or suggestion of lateral color being an issue for imaging an object, there is no

motivation within Shafer to create a system for correcting such color. Consequently, Shafer does not teach or suggest the limitations of claim 46.

As set forth above, the cited art, alone or in combination, do not teach the limitations of added claim 46, nor claims dependent therefrom. Accordingly, the allowance of added claims 46-51 is respectfully requested.

CONCLUSION

This response constitutes a complete response to all of the issues raised in the Office Action dated October 31, 2002. In view of the remarks traversing the rejections in the Office Action, pending claims 21-40 and 46-51 are in condition for allowance. If the Examiner has any questions, comments, or suggestions, the undersigned earnestly requests a telephone conference.

The Commission is authorized to charge any required fees to Conley Rose, P.C. Deposit Account No. 03-2769/5589-00807.

PETITION FOR EXTENSION OF TIME

Applicant respectfully petitions the Commissioner for a one-month extension of time under 37 C.F.R. § 1.136 within which to respond to the Office Action mailed October 31, 2002, such extension allowing the undersigned until February 28, 2003 to respond.

The Commissioner is authorized to charge the extension fee and any additional fees which may be required, or credit any overpayment, to Conley Rose, P.C. Deposit Account No. 03-2769/5589-00807.

Respectfully submitted,

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ATTACHMENT A
"Marked-Up" Amendments

IN THE SPECIFICATION

Please amend pg. 1, line 30 - pg. 2, line 27 as follows:

In the above-noted '976 Shafer patent, an optical system is disclosed, which is based on the Schupmann achromatic lens principle producing an achromatic virtual image, and which combines it with a reflective relay to produce a real image. The system, reproduced here as Fig. 7, includes an aberration corrector group of lenses 101 for providing correction of image aberrations and chromatic variation of image aberrations, a focusing lens 103 receiving light from the group 101 for producing an intermediate image 105, a field lens 107 of the same material as the other lenses placed at the intermediate image 105, a thick lens 109 with a plane mirror back coating 111 whose power and position is selected to correct the primary longitudinal color of the system in conjunction with the focusing lens 103, and a spherical mirror 113 located between the intermediate image and the thick lens 109 for producing a final image 115. Most of the focusing power of the system is due to the spherical mirror 113. It has a small central hole 117 near the intermediate image 105 to allow light from the intermediate image 105 to pass therethrough to the thick lens 109. The mirror coating 111 on the back of the thick lens 109 also has a small central hole 119 to allow light focused by the spherical mirror 113 to pass through to the final image 115. While primary longitudinal (axial) color is corrected by the thick lens 109, the Offner-type field lens 107 placed at the intermediate image 105 has a positive power to correct secondary longitudinal color. Placing the filed lens slightly to one side of the intermediate image 105 corrects tertiary longitudinal color. Thus, axial chromatic aberrations are completely corrected over a broad spectral range. The system incidentally also corrects for narrow band lateral color, but fails to provide complete correction of residual (secondary and higher order) lateral color over a broad UV spectrum.

Please amend pg. 4, line 6 as follows:

[Disclosure] Summary of the Invention

Please amend pg. 9, line 32 - pg. 10, line 19 as follows:

The catadioptric group 17 seen in Fig. 1 includes a first optical element consisting of a fused silica meniscus lens 39 with a concave reflective surface coating 41 on a back surface of the lens 39, and also includes a second optical element consisting of a [first] <u>fused</u> silica lens 43 with a reflective surface coating 45 on a back surface of the lens 43. (The front surfaces of the two lens elements 39 and 43 of the catadioptric group 17 face each other.) The reflective surface coatings 41 and 45 are typically composed of aluminum, possibly with a MgF_2 overcoat to prevent oxidation. Aluminum has a nearly uniform reflectivity of at least 92% over the entire near and deep UV wavelength range. Other metals commonly used as reflective coatings in the visible portion of the spectrum have reflectivities that vary considerably with wavelength or even become opaque in the deep UV. For example, silver drops to only 4% reflectivity at 0.32 μm. Possible alternative to aluminum, but with somewhat lower reflectivities near 60%, include molybdenum, tungsten and chromium. These may be favored in certain high power applications, such as laser ablation. Specialized coatings, including long-wave pass, short-wave pass and band pass dichroic reflective materials, partially transmissive and reflective material coatings, and fluorescent coating, could all be used for a variety of specialized applications.

Please amend pg. 11, lines 13-27 as follows:

Light from the intermediate image 13 passes through the optical aperture 37 in the first lens 39 then through the body of the second lens 43 where it is reflected back through the body of the second lens 43 by the planar or near planar mirror coating 45 on the back surface of the lens 43. The light then passes through the first lens 39, is reflected by the mirror surface 41 and passes back through the body of the first lens 39. Finally the light, now strongly convergent passes through the body of the second lens 43 for a third time, through the optical aperture 47 to the final image [47] <u>19</u>. The curvatures and positions of the first and second lens surfaces are selected to correct primary axial and lateral color in conjunction with the focal lens group 11.

Please amend pg. 15, lines 1-25 as follows:

With reference to Fig. 4, a tube design for using the imaging system of Fig. 1 as a microscope objective is shown. Illumination of a sample surface being imaged by the objective of Fig. 1 may be made through the object itself, by means of an ultraviolet light source 61, such as a mercury vapor lamp or

excimer laser, together with conventional illumination optics 63, 65, 67, leading to a beamsplitter 69 in the objective's optical path. The imaging path for light received from the objective of Fig. 1 is via transmission through the beamsplitter 69 to a microscope tube, whose design may also be catadioptric. The tube elements include a pair of opposite facing negative meniscus lenses 71 and 73 closely spaced to one another, and two spherical mirrors 75 and 77 spaced from each other and from the pair of lenses 71 and 73 by at least 400 mm. The curvature of mirror 75 is concave toward the lenses 71 and 73 and the mirror 77, while the curvature of mirror 77 is convex toward the mirror 75, both curvatures being at least 1000 mm radius, i.e. nearly flat. The mirrors [73] 75 and [75] 77 fold the optical path off-axis so that the system length is under 500 mm. One example optimized for the particular objective seen in Fig. 1 has the following characteristic refractive and reflective surfaces for optical elements 71, 73, 75, and 77:

Please amend pg. 16, lines 1-26 as follows:

Referring now to Fig. 5, yet another use for the imaging system of Fig. 1 is for wafer inspection, namely as a directional dark field, scattered light collector. A UV laser illumination source 81 directs a beam 85 through holes 83 and 87 formed in lenses 39" and 43" and reflective coating 41" and 45" of the catadioptric group onto a surface 89 to be inspected. Alternatively, only the reflective coating 41" and 45" might be absent or only partially reflective to form transparent or at least partially transmissive windows for the light beam 85. The beam 85 might also enter the system from below the hemispherical reflector 41". The angle of incidence is oblique, i.e. at least 60° from vertical due to the high numerical aperture (about 0.90) of the imaging system. Illumination may be done from more than one direction and angle of incidence. The specularly reflected light 93 passes through holes 91 and 95 formed in lenses 39" and 41" and reflective coatings 41" and 45" of the catadioptric group (or in the coatings 41" and 45" only). UV light scattered by features on the sample surface 89 are imaged by the catadioptric imaging system of Fig. 1, beginning with the catadioptric group, then through the achromatic field lens group, and focusing lens group, to the tube elements 71, 73, 75 and 77 of the tube system (absent the illumination group 61[-], 63, 65, 67 and 69).

Please amend pg. 17, lines 9-34 as follows:

Fig. 6 shows a wafer inspection apparatus that can use the catadioptric imaging system as a UV objective 86 for the apparatus. The apparatus may be constructed according to one or more of U.S. Patents 4,247,203; 4,556,317; 4,618,938; and 4,845,558 of the assignee of the present invention. A

semiconductor wafer 82 with a plurality of integrated circuit die 84 at some stage of formation on the wafer 82 is shown lying in a carrier or stage 80. The stage 80 is capable of providing movement of the wafer [80] 82 with translational X and Y and rotational θ motion components relative to a UV microscope objective 86, such as the catadioptric imaging system seen in Fig. 1. Light [83] 88 collected from a die 84 or a portion of a die and formed into a magnified image of that die or portion by the objective 86 is transferred through a relay lens or lens system 90, such as the tube lens system seen in Fig. 4, into the aperture of a video or CCD array camera 92 sensitive to deep UV light. The output 94 of the camera 92 is fed into a data processor 96, which compares pixel data relating to the UV image of the die or die portion either to data corresponding to other portions of the image or to stored data from previous images relating to the die or other die portions. The results of this comparison are fed as data 98 to an output device, such as a printer or a CRT display, or to a data storage unit.

Please amend pg. 20, lines 7-31 as follows:

The depth of focus of an optical system (proportional to wavelength and inversely proportional to the square of the system's numerical aperture) is intrinsically very short in the ultraviolet spectrum (typically on the order of 0.1 to 0.5 μm). This can create a problem in imaging patterned wafers and other similar surfaces with nonplanar profiles. With the broadband UV optics of the present invention, we can use multiple UV wavelength imaging at different depths and computer software integration of the resulting images to extend the depth of focus to about 1 μm. For example, we can scan the surface of a wafer or other object at three different UV colors with about a 10 to 50 nm wavelength separation (e.g., at 0.20, 0.22 and 0.24 μm) using three different focal planes for the different wavelengths to image different slices of the surface. A confocal microscope configuration with the UV objective of the present invention and with three detectors having corresponding bandpass filters could be used for this purpose. The three images can then be integrated by a computer to produce a composite with the increased depth of focus. The small depth of focus of the high N.A. lens systems can also be used to advantageously [to] produce high resolution image slices at various depths than can be integrated to form a 3-D image.

IN THE CLAIMS

Please amend claims 21, 29-32, 34, 36, 37, and 39 as follows. Also following is a list of the remaining claims in their pending form.

21. (Amended) A broad band ultraviolet achromatic catadioptric inspection system, comprising a broad band ultraviolet objective [lens] configured to image a first object at a first ultraviolet wavelength and to image a second object at a second ultraviolet wavelength different than the first ultraviolet wavelength, wherein the objective [lens] comprises a first lens and a second lens having different dispersions, and wherein the system is configured to detect defects on the first or second object using the image of the first or second object, respectively.

22. (Unchanged) The system of claim 21, wherein the first and second objects are selected from the group consisting of a reticle, a resist, and a semiconductor wafer.

23. (Unchanged) The system of claim 21, wherein the first and second ultraviolet wavelengths are selected based on the first and second objects, respectively.

24. (Unchanged) The system of claim 21, wherein the first and second objects comprise different materials, and wherein the first and second ultraviolet wavelengths are selected based on reflectivities of the different materials at different ultraviolet wavelengths.

25. (Unchanged) The system of claim 21, wherein the first and second ultraviolet wavelengths are selected from the group consisting of 193 nm, 248 nm, and 365 nm.

26. (Unchanged) The system of claim 21, wherein the first and second ultraviolet wavelengths are separated by about 10 nm to about 50 nm.

27. (Unchanged) The system of claim 21, wherein the first or second object comprises a reticle, and wherein the first or second ultraviolet wavelength is an exposure wavelength for which the reticle has been constructed.

28. (Unchanged) The system of claim 21, wherein the first and second objects comprise different resists, and wherein the first and second ultraviolet wavelengths comprise about 313 nm and about 220 nm, respectively.

29. (Amended) The system of claim 21, wherein a field size of the objective [lens] is about 0.5 mm diameter.

30. (Amended) The system of claim 21, wherein the objective [lens] has a significantly flattened field.

31. (Amended) The system of claim 21, wherein the objective [lens] corrects primary and residual longitudinal and lateral color over a wavelength band of at least 20 nm.

32. (Amended) The system of claim 21, wherein the objective [lens] further comprises a focusing lens group configured to focus ultraviolet light at an intermediate image, a field lens group disposed proximate the intermediate image, wherein the field lens group comprises the first lens and the second lens, and a catadioptric relay group configured to form a final image of the intermediate image.

33. (Unchanged) The system of claim 21, further comprising an excimer laser configured to illuminate the first and second objects with ultraviolet light at the first and second ultraviolet wavelengths, respectively.

34. (Amended) The system of claim 21, wherein the objective [lens] is further configured to image the first and second objects with light scattered by the first and second objects, respectively.

35. (Unchanged) The system of claim 21, further comprising a ring dark field illumination source configured to illuminate the first and second objects with ultraviolet light at the first and second ultraviolet wavelengths, respectively.

36. (Amended) The system of claim 21, wherein the system is <u>further</u> configured to classify defects and features on the first or second object using the image of the first or second object, respectively.

37. (Amended) A broad band ultraviolet achromatic catadioptric inspection system, comprising:

a broadband ultraviolet light source configured to illuminate a first object with a first ultraviolet wavelength and to illuminate a second object with a second ultraviolet wavelength different than the first ultraviolet wavelength; and

a broad band ultraviolet objective [lens] configured to image the first object at the first ultraviolet wavelength and to image the second object at the second ultraviolet wavelength, wherein the objective [lens] comprises a first lens and a second lens having different dispersions,

and wherein the system is configured to detect defects on the first or second object using the image of the first or second object, respectively.

38. (Unchanged) The system of claim 37, wherein the first or second object comprises a reticle, and wherein the first or second ultraviolet wavelength is an exposure wavelength for which the reticle has been constructed.

39. (Amended) The system of claim 37, wherein the objective [lens] is further configured to image the first and second objects with light scattered by the first and second objects, respectively.

40. (Unchanged) The system of claim 37, wherein the light source comprises an excimer laser.

Please add claims 46-51 as follows:

46. (Added) A broad band ultraviolet achromatic catadioptric inspection system, comprising a broad band ultraviolet objective configured to correct primary and residual longitudinal and lateral color over an ultraviolet wavelength band greater than approximately 10 nm.

47. (Added) The system of claim 46, wherein the objective is configured to correct primary and residual longitudinal and lateral color over an ultraviolet wavelength band greater than approximately 90 nm.

48. (Added) The system of claim 46, wherein the objective is configured to correct primary and residual longitudinal and lateral color over an ultraviolet wavelength band between approximately 0.193 nm and approximately 0.400 nm.

49. (Added) The system of claim 46, wherein the objective comprises a field lens group with two or more different refractive materials.

50. (Added) The system of claim 49, wherein the objective is substantially absent of cementing material at an interface between the two or more different refractive materials.

51. (Added) The system of claim 46, wherein the objective comprises a focusing lens group comprising a first set of lenses and a second set of lenses, wherein the first set of lenses is spaced from the second set of lenses by at least one-half of a total thickness of the second set of lenses.